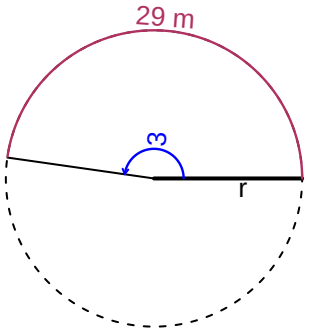
Name: Date:

Trig Final (SLTN v640)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 29 meters. The angle measure is 3 radians. How long is the radius in meters?

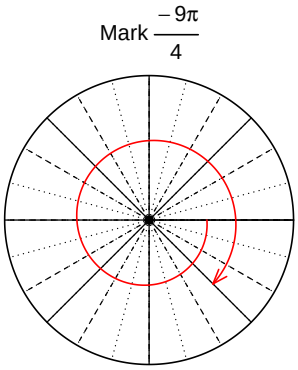


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

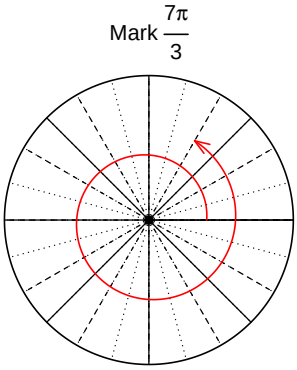
$r = 9.667$ meters.

Question 2

Consider angles $\frac{-9\pi}{4}$ and $\frac{7\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{-9\pi}{4}\right)$ and $\sin\left(\frac{7\pi}{3}\right)$ by using a unit circle (provided separately).



Find $\cos(-9\pi/4)$



Find $\sin(7\pi/3)$

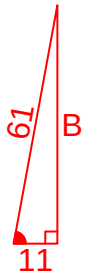
$\cos(-9\pi/4) = \frac{\sqrt{2}}{2}$

$\sin(7\pi/3) = \frac{\sqrt{3}}{2}$

Question 3

If $\cos(\theta) = \frac{11}{61}$, and θ is in quadrant IV, determine an exact value for $\sin(\theta)$.

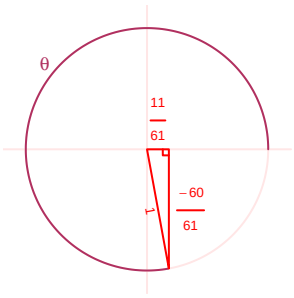
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$11^2 + B^2 = 61^2$$
$$B = \sqrt{61^2 - 11^2}$$
$$B = 60$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\sin(\theta) = \frac{-60}{61}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = -6.62$ meters, a frequency of 2.86 Hz, and an amplitude of 5.44 meters. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 5.44\cos(2\pi 2.86t) - 6.62$$

or

$$y = 5.44\cos(5.72\pi t) - 6.62$$

or

$$y = 5.44\cos(17.97t) - 6.62$$